Cloud Computing

1	Subject Name	Cloud Computing
2	Course Code	
3	Teaching Hours/week	2 hours/Week
4	Practical /week	1 Hour/Week
5	Credits	4
6	Reference Book	Cloud Computing Principals and Paradigms
7	Teaching method	Lecture & Problem Based Learning
8	Subject Status	
9	Prerequisite	Non

Course Description

The Cloud Computing course cover the main concepts, terminologies, network & security deployment mechanisms, virtualizations, hypervisors and types of cloud computing. The idea is to equip the students with the knowledge of the cloud computing and enable them to build a sample cloud computing environment using their own laptops. The private and public cloud along with the most famous Cloud Service Providers (CSP) will also be described in details.

Learning Objectives

This course investigates cloud computing models, techniques, and architectures. Cloud computing has evolved as a very important computing model, which enables information, software, and other shared resources to be provisioned over the network as services in an on-demand manner. Students will be exposed to the current practices in cloud computing. Topics may include distributed computing models and technologies, Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), virtualization, security and privacy issues, performance and systems issues, capacity planning, disaster recovery, Cloud OS, challenges in implementing clouds, data centers, hypervisor CPU and memory management, cloud hosted applications, and other advanced and research topics in cloud computing. Farther more we will also cover cluster concept and implementation. Course work will include homework assignments, presentations, and a term project that will provide exposure to scientific research in cloud computing. Material may be covered from sources other than the text including research papers.

Week 1	**Chapter 1 – Computing paradigm** - High-Performance Computing - Parallel Computing - Distributed Computing - Cluster Computing - Grid Computing - Cloud Computing
Week 2	**Chapter 2 Cloud Computing Fundamentals** - The Need for Cloud Computing - Defining Cloud Computing - NIST Definition of Cloud Computing - Cloud Computing Is a Service - Cloud Computing Is a Platform - Principles of Cloud computing
Week 3	**Chapter 2 Cloud Computing Fundamentals:** - Five Essential Characteristics - Four Cloud Deployment Models - Three Service Offering Models - Requirements for Cloud Services - Cloud Application
Week 4	**Chapter 3 – Cloud Computing Architecture and Management** - Cloud Architecture - Layer 1 (User/Client Layer) - Layer 2 (Network Layer) - Layer 3 (Cloud Management Layer) - Layer 4 (Hardware Resource Layer)
Week 5	**Chapter 3 (continued):** - Migrating Application to Cloud - Approaches for Cloud Migration

Week 6	**Chapter 4 Cloud Deployment Models** - Introduction - Private Cloud - On-Premise Private Cloud - Outsourced Private Cloud - Public cloud - Hybrid cloud - Community cloud
Week 7	**Chapter 5 – Cloud Service Models.** - Introduction - Infrastructure as a Service - Platform as a Service - Software as a Service
Week 8	**Chapter 6 Virtualization** - Virtualization - Approaches in Virtualization - Full Virtualization - Para virtualization
Week 9	**Chapter 6 (continued)** - Hypervisor and Its Role - Types of Virtualization - OS Virtualization - Server Virtualization - Memory Virtualization - Storage Virtualization - Network Virtualization - Application Virtualization
Week 10	**Chapter 10 – Networking for Cloud Computing** - Introduction - Overview of Data Center Environment - Architecture of Classical Data Centers - Storage and Networking Infrastructure - Networking Issues in Data Centers

Week 11	**Chapter 10 – (continue)**
	- Transport Layer Issues in DCNs
	- TCP Impairments in DCNs
	  o TCP Incast
	  o TCP Outcast
	  o Queue Buildup
	  o Buffer Pressure
	- TCP Enhancements for DCNs
	- TCP with Fine-Grained RTO (FG-RTO
	- TCP with FG-RTO + Delayed ACKs Disabled

Week 12	**Chapter 11 – Cloud Service Providers**
	- Google
	  o Cloud Platform
	  o Cloud Storage
	  o Google Cloud Connect
	  o Google Cloud Print
	  o Google App Engine
	- Amazon Web Services
	  o Amazon Elastic Compute Cloud
	  o Amazon Simple Storage Service
	  o Amazon Simple Queue Service
	- Microsoft
	- Windows Azure
	- IBM
	  o Cloud Models
	  o IBM SmartCloud
	- Salesforce
	- Rackspace

Week 13	**Chapter 12 Security in Cloud Computing**
	- Cloud General Challenges
	- Security Aspects
	  o Data Security
	  o Access Control
	  o Encryption and Decryption
	  o Virtualization Security
	- Network Security

Week 14	**Chapter 12 – (Continue)** - Software-as-a-Service Security Issues - Platform-as-a-Service Security Issues - Infrastructure-as-a-Service Security Issues

Week 15	**Clustering** - Purpose of Clustering - Cluster components - Major type of cluster o -Storage o -High availability o -Load balancing o -High performance - Clustering functionality - Cluster share volumes
Week 16	**A Sample Practice:** - Creating a private cloud service provide (CSP) infrastructure using a single laptop with the open source tools like OpenStack and CloudStack

Assessment

1) Midterm exams 20 %
2) Attendance and group work 10 %
3) Projects, presentations, and other tasks 10 %
4) Final Exam 60 %

Total Marks: **100**

Recommended Books:

- Cloud Computing Principals and Paradigms